

## Circular Motion, Torque, and Simple Harmonic Motion Review Sheet

### AP Physics

#### 1. Circular Motion (Uniform):

- a. Variables (units): Force (N), radius (m), velocity (m/s), acceleration (m/s/s), period (s).
- b. Velocity vector points tangent to the circle at any time.
- c. Centripetal acceleration vector points radially inwards at all times.
- d. Centripetal force vector points radially inward, and may be identified as the net force resulting from some 'real' force. Examples of 'real' forces that may be called centripetal forces are tension, static friction, normal force, etc.
- e. Non-banked and banked curves.
- f. Equations.
- g. Newton's Law of Universal Gravitation.
- h. Kepler's laws.

#### 2. Torque:

- a. Angular position, velocity, and acceleration equations.
- b. Relationship between angular kinematics equations and translational kinematics equations.
- c. Torque equation.
- d. Static equilibrium:
  - i. Net force equals zero.
  - ii. Net torque equals zero.
  - iii. Both cases must be met in order for the object to be in static equilibrium.

#### 3. Simple Harmonic Motion:

- a. Variables (units): Amplitude (m), period (s), frequency (Hertz: Hz), angular frequency (radians per second: rad/s), velocity (m/s), acceleration (m/s/s), length (m).
- b. Graphing:
  - i. Sines or cosines, with amplitude, wavelength, period, and frequency.
  - ii. From graphs and equations, it is possible to determine the maximum and minimum displacement, velocity, and acceleration, and the potential and kinetic energies.
- c. Equations.
- d. Mass on a Spring:
  - i. A mass moving back and forth on a frictionless surface or 'hanging' in a zero gravitational field.
  - ii. Equations.
- e. Simple Pendulum:
  - i. Small angle approximation.
  - ii. Equations.